

Notes on some North American Odonata with descriptions of three new species.

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(In the following paper I have followed the generic divisions of Dr. Hagen's "Synopsis of the Odonata of N. America," 1875, in Proc. Bost. Soc. Nat. Hist. xviii, pp. 20-96.)

Epitheca Walshii Scudder.

In 1875, Dr. Hagen recorded this species as only from the White Mountains of New Hampshire. Miss Mattie Wadsworth took a single male of this species at Manchester, Kennebec Co., Maine, on July 16, 1888. Thanks to the kindness of Miss Wadsworth, I have compared this male with Mr. Scudder's original description (Proc. Bost. Soc. Nat. Hist. x, p. 217); the only differences which I noted were that this male has no yellowish spot on the side at base of the fourth abdominal segment, and has a yellow spot on each side of the sixth and seventh segments at apex.

Mr. William Sheraton took a female, which I believe belongs to this species, at Pictou, Nova Scotia, July 23, 1889. The female *Walshii* has not hitherto been described. This female differs from the male as follows:

♀.—Nasus more yellowish. Anterior femora entirely brown, except at the apex. Abdomen with a yellow spot on each side of segments 4 and 8 at base, but no yellow spot on each side of 6 and 7 at apex; dorsum of 10 entirely black. Abdomen shaped as in the ♂, but a little wider at the base, not so narrow at the third segment, and the apex of fifth is not quite as wide as the first segment. Appendages twice as long as the last two segments, simple, straight, subcylindrical, narrower at the base, clothed with short hairs, apex acute. Vulvar lamina erect, excavated within, apex rounded, entire.

Total length 48 mm. Abdomen (incl. app.) 36 mm. Appendages 4 mm. Anterior wing 33 mm. Posterior 32 mm. Pterostigma 3 mm.; 8 antecubitals on the anteriors, 5 on posteriors. Postcubitals, anteriors R 6, L 5, posteriors 6; 3 discoidal areolets, then 2 rows on anteriors; 2 rows, then 3 rows, on posteriors. Discoidal triangles of all four wings crossed by one vein.

The ♀ *Walshii* is much like the ♀ *foreipata* Scud., specimens of which I have not seen. Baron de Selys (Syn. Cordul. 1871) describes the ♀ *foreipata* as having the "abdomen épais à la base, non étranglé, . . . écaille vulvaire . . paraissant un peu emarginée au milieu," which, in addition to the color differences, apparently separate it from ♀ *Walshii*. In his Second Addit. Syn. Cordul., 1878, Baron de Selys places *Walshii* in that group of his subgenus *Somatochlora* characterized by the females having the "écaille vul-

vaire, médiocré, émarginée ou fendue." In his list of species of *Cordulina*, appended to the Second Additions, he indicates that he has seen only the male *Walshii*. He has, therefore, probably placed *Walshii* in that group for reasons based on the relations of the male to the males of other species of *Somatochlora*.

Libellula incesta Hagen.

Miss Wadsworth has sent me three males and three females of this species from Manchester, Kennebec Co., Maine, taken June 18, 19, 25, July 9, 16, 1889. The males agree with Dr. Hagen's description (Syn. of 1861, p. 155). The female has not been described. A description of my specimens follows:

♀.—Frons deeply grooved above, brown, lighter on the sides. Nasus brown, yellowish on sides. Rhinarium brown. Labrum yellowish, brown at the middle of the base. Labium, labial palpi yellowish. Vertex truncate at apex, dark brown with a yellow spot above posteriorly. Occiput dark brown, with a divided yellow spot behind. Rear of eyes dark brown, with two yellow spots.

Anterior lobe of prothorax brown, with a median, dorsal yellow spot; posterior lobe yellowish, entire.

Dorsum of thorax dark reddish brown, with a median yellow stripe. Sides light yellow, dark brown at bases of wings and of feet, a short brownish line on the second lateral suture. Pectus yellowish.

Feet black; trochanters and coxæ yellowish, also the anterior femora inferiorly.

Abdomen yellowish. Dorsum of 1 brownish. A dark brown median dorsal stripe on 2-9. Dorsum of 10 obscure yellowish. A brown stripe on the sides of 1, 2, and the apical half of 3. Abdomen beneath obscure yellowish.

Appendages longer than the 10th segment, simple, straight, apex acute.

Vulvar lamina erect, but short; its outline, viewed directly from below, is almost semicircular.

Wings hyaline; a brownish basal streak on all the wings, between the subcostal and median nervules, hardly extending to the first antecubital;* the nodus surrounded by a brownish tinge, and the apex edged with brownish. Pterostigma very dark brown, surmounting parts of 5-6 cellules. Antecubitals, 16-17 on anteriors, 12-14 on posteriors. Postcubitals 11-13 on anteriors, 13-14 on posteriors; 4, then 3 rows of discoidal areolets on anteriors; 3, then 2 rows on posteriors. Discoidal triangle of anteriors usually crossed by two veins, of posteriors crossed by one vein. Internal triangle of anteriors of 4 cellules, not always formed in the same manner. No internal triangle on posteriors. One hypertrigonal on anteriors, placed over the discoidal triangle. No hypertrigonals on posteriors (a trace of one exists in one wing of one specimen). One basal postcostal cross-vein, usually, but not always, placed nearer the base than the first antecubital.

Total length 50-51 mm. Abdomen 33-34 mm. Anterior wing 40 mm. Posterior 39 mm.

* In one of my three specimens the basal streak extends to the third antecubital on the anteriors, to the second antecubital on posteriors.

My three specimens are of different ages; in the oldest individual the colors are darker, often pruinose, the yellowish colors on the head become brownish, the yellow on the sides of the thorax is more restricted.

A hitherto unrecorded locality for this species is New Jersey, where Mr. S. F. Aaron has taken males on July 21st (Amer. Ent. Soc. collection).

Leptemis gravida (Hagen mss.) n. sp.

♂.—Vertex prominent, dark metallic blue (brownish in younger individuals), truncated and slightly grooved at summit. Frons dark metallic blue (or brownish), sometimes with a brownish spot each side above, with a median groove above. Nasus yellowish, brownish or bluish in the middle. Rhinarium yellowish or brownish. Labrum dark metallic blue. True labium black. Labial palpi yellow, internal margin broadly edged with black. Mandibles black, with a yellow spot at base. Occiput dark brown. Rear of eyes black, with two yellow spots (obscure in older individuals).

Prothorax pruinose, anterior lobe with its anterior margin edged with yellow, posterior lobe broad, bilobed.

Thorax reddish brown (pruinose in older individuals); a more or less distinct transverse black band at anterior margin, some blackish marks near the bases of the feet.

Feet black, or dark brown.

Abdomen bright yellowish, or reddish brown, dorsum of segment 2 sometimes blackish at apex; 3 with a small black spot on each side of the dorsum at apex, or as in 4-9; 4-9 with a dorsal median black band, dilated at the apex and sometimes at the base of each segment; on 9 the reddish brown is reduced to a small spot each side; dorsum of 10 with a small blackish spot at base. Abdomen beneath light brownish, most of the segments with a blackish streak each side. In older individuals the abdomen is mostly pruinose, except the last segment. The abdomen is compressed at base, slightly narrower at 3, becoming a little wider at 6, thence decreasing slightly to the apex.

Genitalia of second segment as follows: Anterior lamina stout, deeply bifid, its apices projecting further downwards than any other part, and armed with short spines. Hamule small, simple, curved; apex acute, black, directed outwards. Genital lobe short, projecting downwards as far as the hamule projects, or a little farther, rounded at the apex, which is broader than at the base.

Superior appendages a little shorter than the last two segments, brownish, with short hairs. Viewed from above, they are approximately parallel; each appendage is constricted after the base, and gradually becomes thicker towards the apex, especially on the internal side; apex obtuse, rounded, bearing a minute terminal spine.

Viewed from the side (see Pl. V, fig. 11), each appendage curves downwards from its base, becoming thicker towards the apex; the inferior margin at a little more than midway from the base bears a rather prominent tooth, and, on the basal side of this tooth, 7 to 10 denticles.

Inferior appendage extends a short distance beyond the tooth of the superiors. Viewed from below (Pl. V, figs. 12, 13), its lateral margins are seen to converge

slightly from base to apex, which is broad, and excised from side to side; in the middle of this excision there is usually a small tubercle, sometimes wanting. Viewed from the side (fig. 11) the appendage is dilated a little before the apex, which is slightly curved upwards.

Wings hyaline, veins brownish; a very slight reddish brown tinge at base, apex edged with brown, and a reddish brown cloud extending from the nodus, or a little before it, half way or more to the pterostigma, and from the costal margin half way or more across the wing. In the younger individuals this cloud is light yellow, sometimes almost absent. Pterostigma long, bright yellow, surmounting one or two cellules. Membranule small, dusky; 10-13 antecubitals on anteriors, 7-8 on posteriors; 9-12 postcubitals. Usually three rows of discoidal areolets on anteriors, two rows on posteriors. Discoidal triangle of anteriors crossed by a single vein,* of posteriors free. Internal triangle of anteriors of three cellules. No internal triangle on posteriors. No hypertrigonals.† One basal postcostal cross-vein, placed nearer the base than the first antecubital.

♀.—Differs from the ♂ as follows:

Vertex generally with a yellow spot above. Labium and labial palpi sometimes almost entirely light brown. A yellow spot on each side of the frons above. Occiput often yellowish. Sometimes a short dark brown mark on the lateral sutures of the thorax. Appendages brown, as long as the last two segments, simple, straight, apex moderately acute; tubercle between them at their bases, prominent, yellow. Vulvar lamina slightly notched in the middle. In some young females, the cloud on the middle of the wings is only distinctly represented by a yellowish costal streak, extending from the fifth or sixth antecubital to the seventh or eighth postcubital. (The same differences of color exist in females of different ages as in the males).

Measurements (in millimeters):

	♂	♀
Total length	46-53	46-56
Abdomen (incl. app.)	32-37	33-40
Appendages	2.25-2.5	2.5-3.25
Anterior wing	37-42	36-44.5
Posterior wing	35.5-39.5	35-42
Pterostigma	4-4.5	4-5

The above description is based on eleven males, ten females from Florida, and four males, ten females from Texas. Mr. E. M. Aaron tells me that he has taken this species at Tarpon Springs and Ponto Rasso, on the Gulf coast of Florida, and that the Texan specimens just referred to were taken by Mr. S. F. Aaron near Corpus Christi and the Nueces River.

Leucorhinia Hageni n. sp.

♂.—Vertex metallic black, with a yellowish spot above. Frons, epistoma and labrum cream-white. Frons with a median groove above, and a transverse black

* In one wing only of two individuals there were two cross-veins.

† One ♀ had one hypertrigonal in both anteriors.

stripe in front of the eyes, extending also on the sides of the frons. Labium and labial palpi black, the external margin of the latter edged with brown. Occiput yellowish brown, darker on the sides. Eyes behind black, with a single yellowish spot.

Prothorax blackish, with a dorsal median yellowish spot on both lobes.

Dorsum of thorax reddish brown, with long, light-colored hairs; a broad, black, median band, which barely attains the summit of the mesothoracic crest, and a humeral black stripe. Sides brownish, with two broad, oblique, black bands, one in front, the other behind the spiracle. Pectus blackish varied with yellowish.

Feet black.

Abdomen black; dorsum of 3-7 with an elongated, median, dorsal yellow spot; 2 mostly yellow, a black spot each side at base; the dorsal yellow spot of 3 extends to the sides at base.

Genitalia: viewed from the side (Pl. V, fig. 3) the internal branch (*a*) of the hamule is rather slender, moderately curved, apex acute; external branch bifid. Viewed ventrally (fig. 4), the bifid portion of the external branch is seen to have one of its divisions (*c*) short, straight and directed outwards and upwards,* while the other division (*b*) is longer and curved inwards and downwards towards its fellow of the opposite side, and has a more acute apex. Genital lobe moderate, hairy at apex.

Superior appendages black, not quite as long as the last two segments; viewed from above, each appendage is straight, narrow at the base, becoming somewhat dilated towards the apex, which is acute. Viewed from the side, each forms a convex curve with the convexity upwards, becoming slightly and gradually dilated from a little after the base to the apex, which is obliquely truncated, so that the truncating line forms an obtuse angle with the inferior margin and an acute angle with the superior margin; inferior margin bears 8 or 9 denticles.

Inferior appendage not as long as the inferior margin of superiors. Viewed from the side, it forms a concave curve with the concavity upwards, apex slightly recurved. Viewed from below (fig. 2), it is broad, lateral margins straight, almost parallel, apex broad, excised from side to side.

Wings hyaline. Anteriors with two dark brown basal streaks, the first between the subcostal and median nervules, the second between the submedian and postcostal nervules; both extend from the base to about one-half the distance to the first antecubital. Posteriors with a dark brown basal streak between the subcostal and median nervules as far as the first antecubital; and a dark brown basal spot, whose anterior margin is the submedian nervule, along which it extends to a short distance beyond the basal postpostal cross-vein, whence its external margin runs obliquely to the apex of the membranule. Costa of all the wings yellowish (except at the base, and superior margin of pterostigma), especially for a short distance beyond the pterostigma. Pterostigma dark brown, with a yellow vein at each end, surmounting one and parts of two other cellules. Membranule dusky; 7 antecubitals on anteriors, 6 on posteriors; 7 postcubitals. Two rows of discoidal areolets on anteriors, irregular on posteriors. All discoidal triangles and the internal triangle of anteriors free. No internal triangle on posteriors; no hypertrigonals. One basal postcostal cross-vein placed nearer the base than the first antecubital.

* That is, upwards with respect to the position of the insect when alive.

♀.—Differs from the male as follows :

Frons, epistoma and labrum brownish. Labial palpi with a distinct light-colored spot at the anterior outer angle (there is an obscure trace of such a spot in the ♂). Dorsum of thorax brown, with no reddish tinge; median band obscure, no humeral band. Sides of 4th and 5th abdominal segments with a yellow spot at base. Appendages longer than segment 19, hardly as long as 9, simple, cylindrical, straight, apex acute. Vulvar lamina (Pl. V, fig. 10) bifid, internal margins of the lobes almost touching each other, apices rounded, hardly reaching to one half the length of the 9th segment. Basal streaks of anterior wings reaching to the 1st antecubital, with clearer yellowish spots. Basal streak of posteriors a little longer; basal spot with small yellow spots and veined with yellow. Pterostigma longer; 6 postcubitals on anteriors. Discoidal triangle of anteriors crossed by one vein. One cross-vein in the internal triangle of left anterior.

Total length, ♂ 29.5 mm.; ♀ 29 mm. Abdomen (incl. app.) 20 mm. Anterior wing 22 mm. Posterior 21 mm. Pterostigma ♂ 1.5 mm. ♀ 2 mm.

The above description is based on one male, one female from Pictou, Nova Scotia, taken June 25, 1889, by Mr. Wm. Sheraton.

I suppose this species to be one of the three—*borealis*, *frigida* and *glacialis*—named, but not described, by Dr. Hagen in 1875. As I am unable to determine which of these three names belongs to this species, I have preferred to avoid any possible confusion arising from a use of one of them. I name this species after Dr. H. A. Hagen, whose kind aid to me, at various times, I thus acknowledge. With his assent I have published the three new species of this paper.

Leucorhinia proxima (Hagen mss.) n. sp. Hagen, Proc. Bost. Soc. Nat. Hist. xviii, p. 79, 1875 (no description).

♂.—Vertex black. Frons and epistoma greenish white. Frons with the usual median groove above, and a transverse black band in front of the eyes, extending also on the sides of the frons. Labrum cream-yellow. Labium black; labial palpi varying from yellowish with the inner edge margined with black, to entirely black. Occiput black above, a brownish spot behind. Rear of eyes black.

Thorax reddish brown, with light-colored hairs; dorsum with a very broad median blackish band, not reaching upwards to the wing-bases, and a blackish humeral stripe. At times the black extends over almost the entire dorsum. A black stripe on the second lateral suture; an irregular black band runs from the 2d to 1st lateral suture above the spiracle. Pectus reddish brown, sometimes marked with blackish.

Feet black, coxæ partly reddish brown.

Abdomen black; segments 2 and 3 mostly yellowish on the sides, and pruinose on the dorsum; 2 with a blackish spot each side at base, and sometimes blackish at apex; apex of 3 blackish, especially on the sides. Abdomen sometimes pruinose underneath.

Genitalia: viewed from the side the internal branch of the genital hamule is shorter and more strongly curved than in *Hageni*, and the external branch does not appear bifid (Pl. V, fig. 5). Viewed ventrally (fig. 6), the two divisions of the external branch in *Hageni* are represented; the one (*c*) is similarly directed,

but is much shorter than in *Hageni*; while the other (*b*), incurved towards its fellow of the opposite side, is hardly as long as (*c*), and much shorter than its homologue in *Hageni*. Genital lobe moderate, apex hairy.

Superior appendages longer than the 10th segment, black. Viewed from above, they converge slightly from the base to about half their length, after which they slightly diverge; each appendage becomes thicker towards the apex, especially on the inner side, and ends in an acute point. Viewed from the side, each appendage is nearly straight, or slightly curved upwards at the middle; the thickness of the appendage at the base is somewhat less than at the apex, which is formed as in *Hageni*; the inferior margin bears six to eight denticles.

The inferior appendage as in *Hageni*, but viewed from the side, the concavity of its curve is not so pronounced.

Wings hyaline. Anteriors with two very short dark brown basal streaks, one between the subcostal and median nervules, the other between the submedian and postcostal nervules; the first of these two extends hardly one-fourth of the distance to the first antecubital, the second is slightly longer. Posteriors with a very short dark brown basal streak between the subcostal and median nervules, extending one third the distance (or a little more) to the 1st antecubital; and a dark brown basal spot as in *Hageni*. Costa and pterostigma as in *Hageni*, but the pterostigma has a brown vein at each end. Membranule dusky; 6-8 antecubitals on anteriors, 6 on posteriors, 7-11 postcubitals on anteriors, 8-9 on posteriors. Two or three rows of discoidal areolets. Discoidal triangle of anteriors crossed by a single vein, of posteriors free. Internal triangle of anteriors of three cellules (one wing of one specimen has two cellules). No internal triangle on posteriors; no hypertrigonals. One basal postcostal cross-vein, placed nearer the base than the 1st antecubital.

♀.—Unknown to me.

Measurements of the ♂. Total length 33-36 mm. Abdomen (incl. app.) 22.5-24.5 mm. Superior appendages 1.5 mm. Anterior wing 25-27 mm. Posterior 25-26 mm. Pterostigma 1.5-2 mm.

The above description is based on three males from Manchester, Kennebec Co., Maine, taken July 10, 11, 16, 1888, by Miss Mattie Wadsworth, and two males from Pictou, Nova Scotia, taken July 26, 1889, by Mr. Wm. Sheraton.

In 1875, Dr. Hagen gave the following localities for this species: British America, Vancouver's Island, White Mountains and Massachusetts.

The identity of my specimens with Dr. Hagen's species is established by the fact that one of the males which I possess from Maine was seen by Dr. Hagen, and has the label "*proxima*" in his handwriting, attached.

Lencorhinia intacta Hagen.

Plate V, figs 1, 7, 8, 9, show the inferior appendage and the genitalia of the second abdominal segment of the male, and the vulvar lamina of the female, for comparison with the similar parts of *L. Hageni* and *proxima*.

I have examined eleven males of *intacta* from Maine, Pennsylvania and South Dakota, in all of which I find that when the inferior appendage is viewed from below, its lateral margins diverge very perceptibly from base to apex. In the males of *Hageni* and *proxima* which I have seen, the lateral margins are approximately parallel.

The internal branch of the genital hamule in *intacta* varies to some extent in different individuals, being sometimes more slender than fig. 7 represents it.

In addition to the localities given for *intacta* by Dr. Hagen in 1875 (Massachusetts, Ohio, Illinois, Wisconsin and Ontario), I can add Manchester, Kennebec Co., Maine, May 25th to July 4th (by Miss M. Wadsworth); Volga, Brookings Co., South Dakota, June 27th (by Mr. P. C. Truman); Philadelphia, June 17th, and Bristol, Pa., June 16th (by Mr. S. F. Aaron in Amer. Ent. Soc. collection).

EXPLANATION OF PLATE V.

- Fig. 1. Inferior appendage of *Leucorhinia intacta* ♂ viewed from below.
 " 2. The same of *L. Hageni* ♂.
 " 3. Genitalia of *L. Hageni* ♂, viewed from the side.
 " 4. " " viewed from below.
 " 5. Genitalia of *L. proxima* ♂, viewed from the side.
 " 6. " " viewed from below.
 " 7. Genitalia of *L. intacta* ♂ viewed from the side.
 " 8. " " viewed from below.
 " 9. Vulvar lamina of *L. intacta* ♀.
 " 10. Vulvar lamina of *L. Hageni* ♀.
 " 11. Appendages of *Lepthemis gravida* ♂, viewed from the side.
 " 12, 13. Two forms of inferior appendage of *L. gravida* ♂, viewed from below.

a, Internal branch of genital hamule.

b, Internal division } of external branch of genital hamule.
c, External division }

d, Genital lobe.